



Daily Space Weather vs. Extreme Events

**Workshop on the Impacts of Space Environment
On National Security and Processes**

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Three points

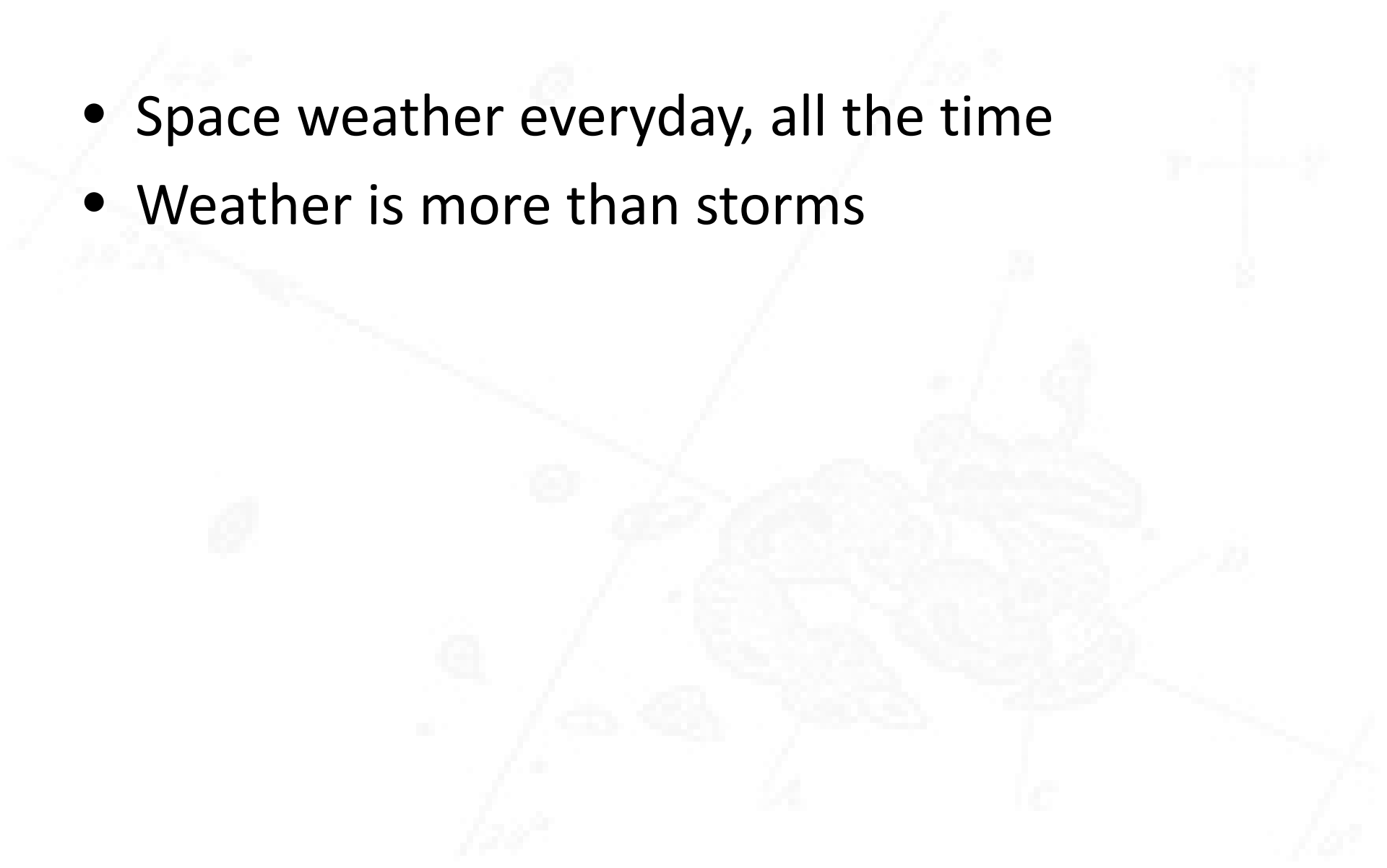
- Space weather impacts happen all the time
- Attention must be paid to daily space weather; focusing only on extreme events does not ensure that we can address impacts of daily space weather
- Meeting the primary challenges will ensure that we are ready for impacts of extreme events and of daily space weather

outline

- Space Weather 24/7
- Range of Space Weather
- Impact of 'Daily' Space Weather
- What is needed to minimize impacts?
- Closing story

Space Weather 24/7

- Space weather everyday, all the time
- Weather is more than storms



Range of Space Weather

- Just like terrestrial weather
- All weather impacts decisions – even if the decision is to do nothing different



Impact of Daily Space Weather

- Constant monitoring – always vigilant
- Position, Navigation and Communication: ionospheric patchiness on a daily basis (scintillation)
- Some regions are worse than others – SAA
- Periodic radio blackouts with flares
- Geomagnetic storms occur when we don't expect them



SOUTHCOM interest

- SOUTHCOM and Service (Army, Navy, Air Force) are evaluating the ability of nanosatellite-based communications to support remote users in Latin America - SNaP
- In partnership with Brasil, a joint CubeSat concept is being pursued to understand the conditions under which ionospheric variability develops that impacts communications



What is needed to minimize impacts?

Three primary challenges for advancement in space weather prediction

1. Recognize precursor signatures for solar flares and coronal mass ejections
2. Understand what causes an event to be geoeffective
3. Identify the conditions for ionospheric disturbances

Three points

- Space weather impacts happen all the time
- Attention must be paid to daily space weather; focusing only on extreme events does not ensure that we can address impacts of daily space weather
- Meeting the primary challenges (previous chart) will ensure that we are ready for impacts of extreme events and of daily space weather



- Wining “Pick 2”
- It is better to be lucky than good
- But at some point you have to be good to win over the long haul – statistics win in the end

Last slide

- In 1972, the US space program was lucky
- In 1989, we got a warning
- In 2012, Planet Earth was lucky
- **Now is the time to become good before our luck runs out!!**